

FTTR (Fiber to the Room) Solution Architecture - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

The telecommunications landscape is undergoing a fundamental paradigm shift as service providers and enterprise network architects strive to deliver ubiquitous gigabit connectivity to the very edge of the premises. The FTTR (Fiber to the Room) Solution Architecture represents the industry's definitive answer to the challenges of in-building wireless and wired coverage, extending the optical access network beyond the traditional demarcation point. This document serves as the authoritative technical datasheet and architectural overview for our carrier-grade FTTR solution, detailing the hardware components, system topology, and performance specifications that enable symmetrical multi-gigabit services to every room, ensuring an unparalleled user experience for high-bandwidth applications such as 8K video streaming, cloud VR/AR, and real-time industrial automation.



ARCHITECTURE & CHASSIS DESIGN

The FTTR architecture is predicated on a revolutionary, optically-native in-premises network, moving beyond the performance bottlenecks of copper-based Ethernet and Wi-Fi mesh backhauls. The system is fundamentally composed of two primary hardware categories: the Optical Line Terminal (OLT) or Primary Optical Network Terminal (P-ONT) at the network ingress point, and a series of Optical Network Units (ONUs) designated as Room ONTs (R-ONTs).

The primary chassis is a compact, fanless 1RU unit designed for discrete wall-mounting or shelf placement. Its industrial design is optimized for passive cooling and silent operation, leveraging a high-efficiency thermal conduction path to the aluminum casing. The chassis integrates a highly integrated system-on-chip (SoC) that functions as the central Optical Distribution Network

(ODN) manager and gateway. Key to its design is a powerful Class B+ optical transceiver module capable of delivering optical power budgets up to 32dB, supporting a maximum logical reach of 1.2 kilometers over a single-mode fiber. This enables a point-to-multipoint (P2MP) topology from the primary unit to up to 16 R-ONTs via a 1:16 optical splitter, eliminating the need for active networking equipment in intermediate wiring closets.

HARDWARE FEATURES

The hardware ecosystem is engineered for both seamless integration and future-proof service delivery. The Primary Unit features a versatile WAN/LAN port that autosenses the incoming service, compatible with GPON, XGS-PON, or direct fiber handoffs. The hardware is equipped with a high-performance Wi-Fi 6 access point integrated directly into the chassis, providing a dual-band concurrent throughput of 1.8 Gbps for legacy wireless devices. However, the architectural highlight lies within the R-ONU hardware. Each R-ONU is a miniature, low-profile device that sits unobtrusively in an end-user room. They are powered via Power over Ethernet (PoE) or a local USB-C power adapter, simplifying deployment. The R-ONU hardware contains a dedicated optical chipset for reliable synchronization with the primary unit, a four-port Gigabit Ethernet switch for fixed-line connectivity, and an integrated Wi-Fi 6 access point to act as a local coverage node. The system leverages a single fiber for

both upstream and downstream data using Wavelength Division Multiplexing (WDM): 1490nm for downstream and 1310nm for upstream.

COMPLIANCE & STANDARDS

The FTTR Solution Architecture is meticulously designed to comply with the most stringent international telecom standards, ensuring global interoperability and regulatory acceptance. The hardware adheres to the ITU-T G.984.x (GPON) and G.9807 (XGS-PON) standards for the optical interface and management layer. Electromagnetic compatibility (EMC) is certified to FCC Part 15 Class B, CE, and RCM standards. Safety is assured through compliance with IEC 62368-1 for audio/video, information, and communication technology equipment. Furthermore, the Wi-Fi hardware modules are fully certified for operation under IEEE 802.11a/b/g/n/ac/ax and are Wi-Fi Alliance certified, ensuring seamless interoperability with the vast ecosystem of client devices. The solution is also designed with the principles of TR-069/TR-369 (CWMP/USP) for remote management, allowing for zero-touch provisioning and robust network monitoring from the cloud or local network management systems (NMS).

TECHNICAL SPECIFICATIONS

Parameter	Specification
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Form Factor	Primary Unit: 1RU Compact Chassis (W: 260mm x D: 180mm x H: 44mm), R-ONU: Desktop/Wall-Mount (W: 120mm x D: 80mm x H: 28mm)
Switching Capacity	Primary Unit: 2.5 Gbps (Downstream) / 1.25 Gbps (Upstream) on PON Interface; Non-blocking 4x1 Gbps LAN ports
Power Supply	Primary Unit: External 12V/2A DC Adapter; R-ONU: PoE PD (802.3af) or 5V/2A USB-C Adapter
Operating Environment	Temperature: 0 ° C to 45 ° C (Primary Unit); -10 ° C to 50 ° C (R-ONU). Humidity: 5% to 95% (Non-condensing)
Optical Specifications	Transmission Wavelength: 1490nm (Downstream) / 1310nm (Upstream). Optical Power Budget: Class B+ (up to 32dB). Max Reach: 1.2 km.

ORDERING OPTIONS

Our FTTR solution is offered in a modular kit-based ordering format to provide maximum flexibility for diverse deployment scenarios. The standard SKU, FTTR-BASIC-KIT, includes one Primary Unit and four R-ONUs, along with a 1:16 optical splitter and a universal power adapter. For greenfield installations or large enterprise environments, the FTTR-EXPANSION-PACK offers single R-ONUs for scaling the network capacity up to the system limit of 16 R-ONUs per PON port. For specialized commercial environments requiring a ruggedized form factor or extended temperature range, the FTTR-IND-RONU variant is available, offering an industrial-grade operating temperature range from -10°C to 50°C and an IP40-rated enclosure. Additionally, a comprehensive selection of pre-terminated fiber optic patch cords, including SC/APC to SC/APC connectors in various lengths, are available as separate line items to facilitate rapid field deployment without the need for field splicing.

